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| Re: | IEEE 80216h-07/013 Task Group Review of P802.16h/D2b | |
| Abstract | This contribution provides updated text to consolidate the credit token based coexistence protocol (CT-CXP) within [1]. This updates takes into account technical editor's notes on the CT-CXP messages names and description. Some other editorial corrections are also added. | |
| Purpose | Consolidation of draft D2b text on credit token based coexistence protocol | |
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Credit token based coexistence protocol text update

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Introduction

This contribution provides updated text to consolidate the credit token based coexistence protocol (CT-CXP) within [1]. This updates takes into account technical editor's notes on the CT-CXP messages names and description. Some other editorial corrections are also added.

Proposed new names for the messages are described in the following Table.

| Section (or Table) /page/line | Editor's notes | Existing message name | Proposed new name |
|----------------------------------|--|-----------------------|---------------------|
| MAC Messages | | | |
| 6.3.2.3/9/33 6.3.2.3.70/18/38 | The name and the description of this message is ambiguous, shall be clearly specified to CT. | ACK | CT_CXP_ACK |
| 6.3.2.3.64/12/39 | The name and the description of this message is ambiguous, shall be clearly specified to CT | ADPD | CT_CXP_ADPD |
| 6.3.2.3.65/13/35 | The name and the description of this message is ambiguous, shall be clearly specified to CT | ADV_REQ | CT_CXP_ADV_REQ |
| 6.3.2.3.66/14/42 | The name of this message is ambiguous, shall be clearly specified to CT | Notification message | CT_CXP_Notification |
| 6.3.2.3.67/15/31 | The name of this message is ambiguous, shall be clearly specified to CT | ADV_RSP | CT_CXP_ADV_RSP |
| 6.3.2.3.68/16/40 | The name and the description of this message is | RA_REQ | CT_CXP_RA_REQ |

| | | | |
|--|--|-----------------------------|------------------------------------|
| | ambiguous, shall be clearly specified to CT | | |
| 6.3.2.3.69/17/53 | the name and the description of this message is ambiguous, shall be clearly specified to CT. | RA_RSP | CT_CXP_RA_RSP |
| Backhaul based Messages | | | |
| 15.4.2.4.1.1/120/59 Table h7/135/52 | The name shall be specified to CT-CXP. | Advertisement Reply | CT-CXP Advertisement Reply |
| 15.4.2.4.1.1/120/59 Table h7/135/55 | The name shall be specified to CT-CXP. | Advertisement Request | CT-CXP Advertisement Request |
| 15.4.2.4.1.1/120/57 Table h7/135/58 | The name shall be specified to CT-CXP. | Negotiation Request | CT-CXP Negotiation Request |
| 15.4.2.4.1.1/120/57 Table h7/135/62 | The name shall be specified to CT-CXP. | Negotiation Reply | CT-CXP Negotiation Reply |
| Table h7/136/1 | The name shall be specified to CT-CXP. | Resource Allocation Request | CT-CXP Resource Allocation Request |
| Table h7/136/5 | The name shall be specified to CT-CXP. | Resource Allocation Reply | CT-CXP Resource Allocation Reply |
| 15.6.1 | Review the usage of the word 'relay' | Relay or relaying | Forward or forwarding |

Specific editorial changes

This section provides a list of changes to the draft document.

Blue text represents specific editorial additions.

~~Red strikethrough~~ text is to be deleted.

Black text is text already in the draft.

Bold italic text is editorial instructions to the editor.

Proposed text changes

[Update text of section 15.4.2.4 as indicate:]

15.4.2.4 Credit token based coexistence protocol (CT-CXP)

In some traffic conditions circumstances, some master subframes are temporally under-used by some BS (offering BS, namely offeror) due to some low traffic activity while some of its neighboring BSs (requesting BS, namely requester) require temporally some additional master sub frame capacity to face some traffic increase. With respect to this, master sub frame sharing between neighbouring systems contributes for better spectrum efficiency. The typically operation of sharing is illustrated in *Figure h55* and *Figure h56* where system S1 proposes to rent out its assigned last OFDM symbols (for a time duration $T_{renting_subframe}$ per master subframe over several consecutive CX frames of total time duration $T_{renting_epoch}$) to system S2 and S3. This master sub frame sharing is supported by the credit token based coexistence protocol (CT-CXP). CT-CXP provides the means for an offeror to rent out temporally some of its master sub frame capacity to some competing requester(s) willing to rent in simultaneously this proposed additional resource. CT-CXP guarantees exclusive access of the offeror's unused master subframe resource to the requester(s) for an agreed time period between the offeror and the requester. During this agreed period, the requester is granted with the resource during which the offeror will not use the resource. Also, CT-CXP ensures over time a fair access of the offeror's master subframe available resource between competing requesters.

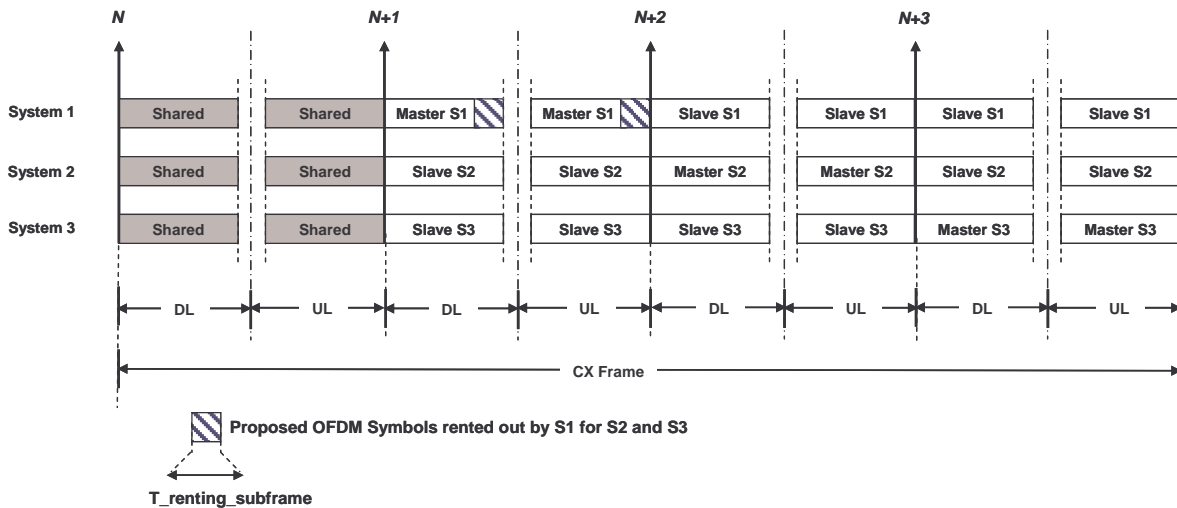


Figure h55: Master subframe (OFDM symbols) sharing within ~~CX Frame~~

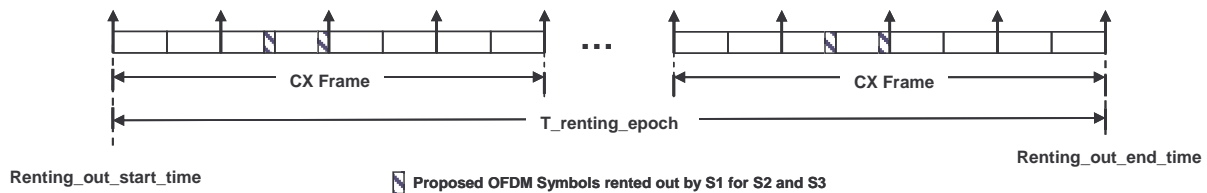


Figure h56: Master subframe (OFDM symbols) sharing over $T_{renting_epoch}$

15.4.2.4.1 CT-CXP Procedures

15.4.2.4.1.1 Whole CT-CXP Procedure

CT-CXP can be instantiated either in a non-negotiated mode or in a negotiated mode. This allows CT-CXP to be flexibly executed as a function of the context (e.g time constraints for negotiation, regulatory spectrum sharing policies and so forth). The followed approach is flexible in that it is scalable and it allows a vendor differentiated implementation of non-negotiated or negotiated (of any types) based CT-CXP.

The non-negotiated mode requires the minimum messages exchange to support CT-CXP between the offeror and requester(s). This mode requires no negotiation iteration between the offeror and requester. This mode can be applied when time availability is very limited to handle several iterations for the negotiations and/or when the ~~CT-CXP negotiated mode~~ is executed over the air (safe mode) through over the air inter-BSs communications.

The negotiated mode is used when time availability is enough to handle several iterations for the negotiation. This mode is operated through IP network based inter-BSs communications.

CT-CXP is composed of several consecutive procedures (offering advertisement, renting request, iterative negotiation, and resource allocation) as shown in *Figure h57*. For the sake of simplicity, this figure is only depicted for one (among multiple) requesters. Over the air based instantiation of CT-CXP for the non negotiated mode is depicted on the left hand side of *Figure h57*. The over IP network based instantiation of CT-CXP for the negotiation or non negotiated mode is depicted on the right hand side of *Figure h57*. MAC messages related to the over the air instantiation are specified in section ~~6.3.2.3~~^{15.3.2.3}. Inter system over the air communications mechanisms are described in subclause 15.6. CXP messages related to IP network based instantiation are specified in section 15.5.1. The offering advertisement message (CT-CXP Advertisement Request) specifies which negotiation mode is used by the CT-CXP. The iterative negotiation procedure is executed only with the negotiated mode and not with the non-negotiated mode.

Within CT-CXP, a renting resource unit (RRU) is defined as the minimum time x frequency unit (e.g. OFDM symbol, or a minimum number of symbols and subcarriers in OFDMA) that can be rented in/out between the offeror and a requester. RRU time duration is denoted RRU duration. A master sub-frame is composed of a fixed amount of ~~RRUs resource units~~. The part of the offeror's available master sub-frame to be rented out is named rented resource. Consequently, an offeror's rented resource is defined as an amount of ~~RRUs resource units~~. A credit token (CT) is the pseudo monetary unit used by CT-CXP ~~allowing to let~~ the requester to rent in a ~~RRU resource unit~~ to the offeror. A ~~RRU resource unit~~ is charged as a number of CTs. Each BS is inially assigned with a CT budget, i.e. a maximum number of CTs. This maximum number can be normalized to the total number of ~~RRUs resource units~~ per master sub-frame. Also, this number can be dynamically specified by policy issued by the RAIS via the BSIS (subclause 15.7).

[Replace Figure h61 with the following updated one as indicate:]

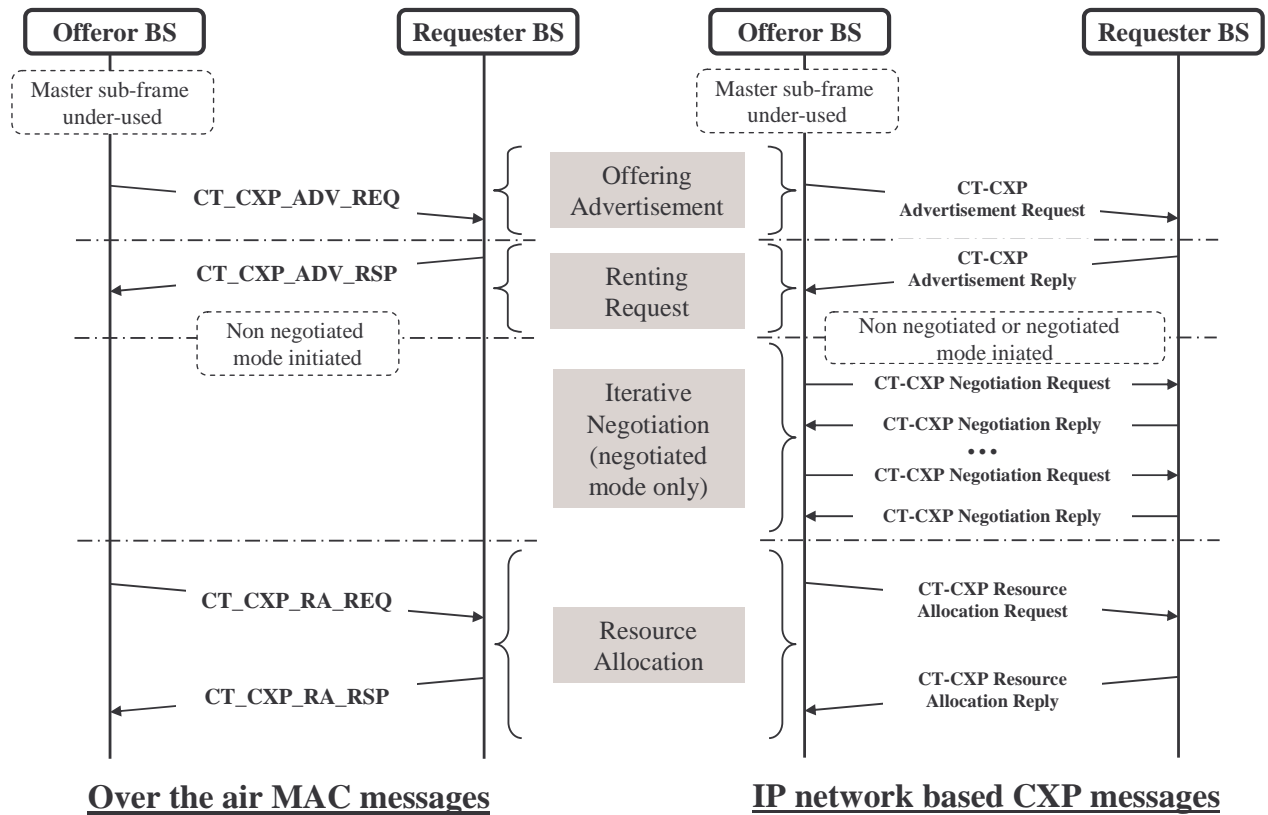


Figure h57: Whole CT-CXP Procedure

The details of these procedures are specified in subsections hereafter.

15.4.2.4.1.2 CT-CXP Offering Procedure

The over the air and IP network based CT-CXP offering procedures are respectively depicted in *Figure h58* and *Figure h59*.

a) The procedure described in *Figure h58* is as follows:

- A BS identifies that a part of its master subframe is going to be under-used and can be rented out. With respect to this, this BS becomes an offeror BS and initiates the renting advertisement by broadcasting the `CT_CXP_ADV_REQ` message. In particular, this message includes information related to the available resource (T_renting_subframe, Renting_out_start_time, Renting_out_end_time) as well as the renting conditions (MNCT: Minimum number of credit tokens per resource unit required per requester's bid), and also a list (LC: List of Channels) of other channels (frequency domain) proposed by the offeror BS for renting.
- If the offeror BS receives one single `CT_CXP_ADV_RSP` message, then the offeror BS grants the renting resource to the single requester by setting the Resource Granting Bit Flag (RGSF) to 1 in the `CT_CXP_RA_REQ` message. The granted requester is not charged with credit token since it is not competing with some other requesters.

- If the offeror BS receives more than one CT_CXP_ADV_RSP message, then it assesses whether he can supply each requester or not:
 - If it can supply, the offeror BS grants the renting resource to all requesters by setting the Resource Granting Bit Flag (RGBF) to 1 in the CT_CXP_RA_REQ message.
 - If it cannot, the offeror BS derives and selects requesters with higher bids based on the information received from competing requesters. The offeror BS grants the resource to the selected requesters by setting the Resource Granting Bit Flag (RGBF) to 1 in the CT_CXP_RA_REQ message. These selected requesters can access to their requested resource Rented_resource_amount from Renting_subframe_start_time to Renting_subframe_end_time during the guaranteed requested time period (Renting_in_start_time, and Renting_in_end_time). RGBT is set to 0 for the non selected requesters.
- The CT_CXP_RA_REQ message includes the clearing price (Clearing_price), ~~mentioning the number of credit tokens the requester has to freeze to acquire the granted resource.~~ Derived from the selection process, the clearing price corresponds to the number of credit tokens per RRU that has to be considered in the pricing method specified within PBF of CT-CXP Advertisement Request message.

[Replace Figure h58 with the following updated one as indicate:]

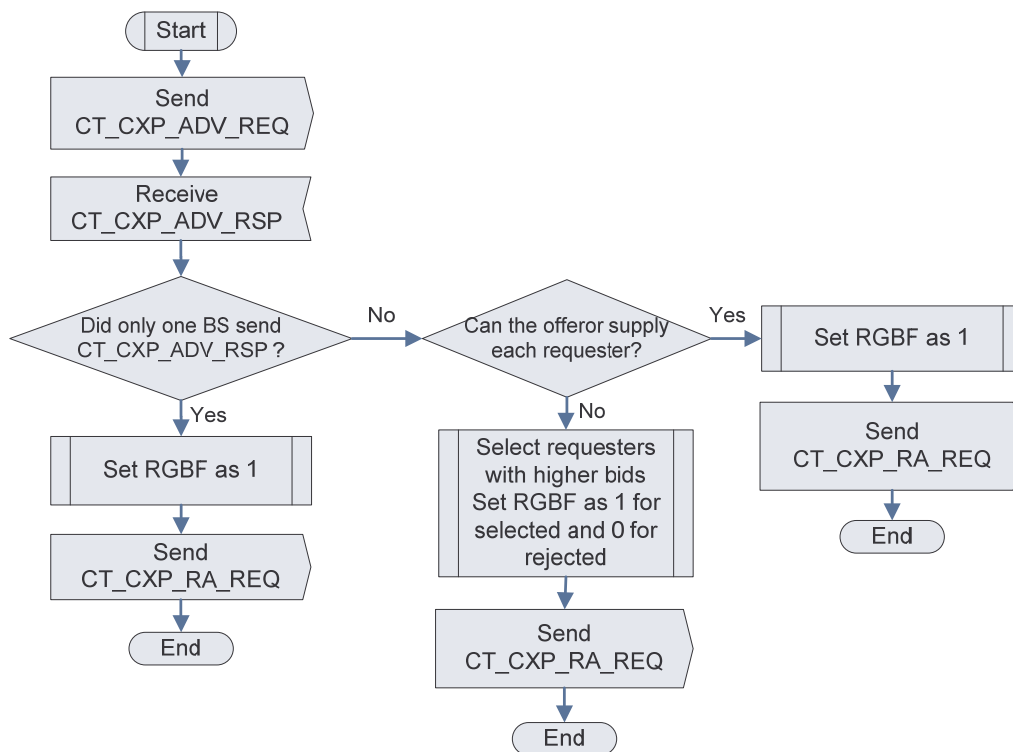


Figure h58: Over the air based CT-CXP offering procedure

b) The procedure described in Figure h59 is as follows:

- A BS identifies that a part of its master subframe is going to be under-used and can be rented out. With respect to this, this BS becomes an offeror BS and initiates the renting advertisement by broadcasting the “CT-CXP Advertisement Request” message. In particular, this message includes information related to:
 - The available resource (T_renting_subframe, Renting_out_start_time, Renting_out_end_time),

- The negotiation mode (NMBF == 0: non negotiated mode is active, NMBF == 1: negotiated mode is active),
- The renting conditions (Start_negotiation_time, End_negotiation_time, MNCT, LC),
- The pricing method in case NMBF~~NMFF~~ == 1.
- If the offeror BS receives one single “CT-CXP Advertisement RRequest” message, then the offeror BS grants the renting resource to the single requester by setting the Resource Granting Bit Flag (R~~GBF~~) to 1 in the “CT-CXP RResource AAllocation Request” message. The granted requester is not charged with credit token since it is not competing with some other requesters.
- If the offeror BS receives more than one “CT-CXP Advertisement RRequest” message, then it assesses whether he can supply each requester or not:
 - If it can supply, the offeror BS grants the renting resource to all requesters by setting the Resource Granting Bit Flag (R~~GBF~~) to 1 in the “CT-CXP RResource AAllocation Request” message.
 - If it cannot, the offeror BS follows the negotiated mode under consideration:
 - If NMBF == 0, same procedure as a) is executed. The offeror BS derives and selects requesters with higher bids based on the information received from competing requesters. The offeror BS grants the resource to the selected requesters by setting the Resource Granting Bit Flag (R~~GBF~~) to 1 in the “CT-CXP RResource AAllocation Request” message. These selected requesters can access to their requested resource Rented_resource_amount from Renting_subframe_start_time to Renting_subframe_end_time during the guaranteed requested time period (Renting_in_start_time, and Renting_in_end_time). R~~GBT~~ is set to 0 for the non selected requesters.
 - If NMBF == 1, iterative negotiation occurs between the offeror BS and each requester BS. Based on the information received within the “CT-CXP Advertisement RReply” message, the offeror BS calculates respectively a minimum and maximum payoff (Minimal_payoff and Maximal_payoff) at each iteration. These payoffs allow selecting the remaining requesters at each iteration. An example of payoff calculation is given in section 15.4.2.4.2. At each iteration, Minimal_payoff and Maximal_payoff are sent within the “CT-CXP Negotiation Request” message. The iterative negotiation occurs until the negotiation period (bounded by End_negotiation_time) is elapsed. At the end of the negotiation, the final requesters are selected by the offeror BS. The offeror BS grants the resource to the selected requesters by setting the Resource Granting Bit Flag (R~~GBF~~) to 1 in the “CT-CXP RResource AAllocation Request” message. These selected requesters can access to their requested resource Rented_resource_amount from Renting_subframe_start_time to Renting_subframe_end_time during the guaranteed requested bounded time period (Renting_in_start_time, and Renting_in_end_time). R~~GBT~~ is set to 0 for the non selected requesters.

[Replace Figure h59 with the following updated one as indicate:]

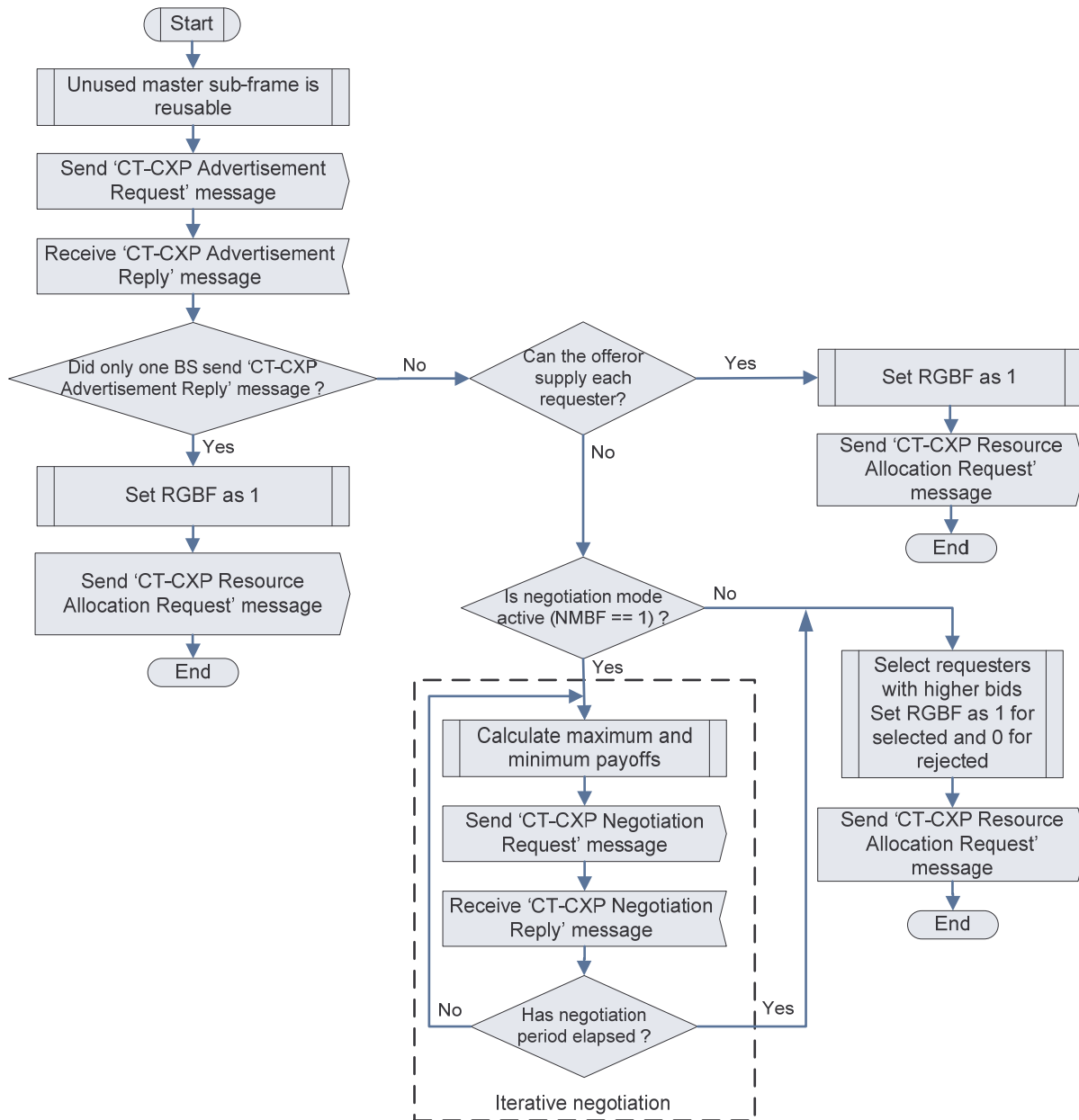


Figure h59: IP network based CT-CXP offering procedure

15.4.2.4.1.3 CT-CXP Requesting Procedure

The over the air and IP network based CT-CXP requesting procedures are respectively depicted in *Figure h60* and *Figure h61*.

a) The procedure described in *Figure h60* is as follows:

- If a BS is in need of additional resource and can meet MNCT requirements, he can make a request (CT_CXP_ADV_RSP message) upon the reception of CT_CXP_ADV_REQ.

- Within CT_CXP_ADV_RSP, the requester informs about the amount of required resource (Rented_resource_amount), the rented in start and end time (Renting_in_start_time, Renting_in_end_time) and the requester's bid (Requester_bid) in term of number of credit tokens bidded per renting resource unit (RRU).
- Upon reception of CT_CXP_RA_REQ message, the requester BS knows whether it has been selected or not. If RGBF is set to 1, the requester BS is selected, otherwise (RGBF set to 0) the requester is rejected.
- The requester decides to accept (Acceptation Bit Flag ABF set to 1) or to reject (ABF set to 0) the resource granting based on the Clearing_price information. This information is sent within the CT_CXP_RA_RSP message.
- If ABF is set to 1, a number of credit tokens equal to $\frac{\text{Clearing_price} * \text{Rented_resource_amount} * T_{\text{renting_subframe}}}{[\text{Renting_in_end_time} - \text{Renting_in_start_time}] / \text{CX_Frame_duration} / \text{RRU_duration}}$ ~~the clearing price~~ will not be usable (for some ~~further~~~~other~~ renting requests by this same requester) for a time duration equal to $[\# \text{Renting_in_start_time}; \# \text{Renting_in_end_time} + \delta]$ where δ is a frozen period margin. This ensures fairness over time between competing requester BSs to access to some other renting offers.

[Replace Figure h60 with the following updated one as indicate:]

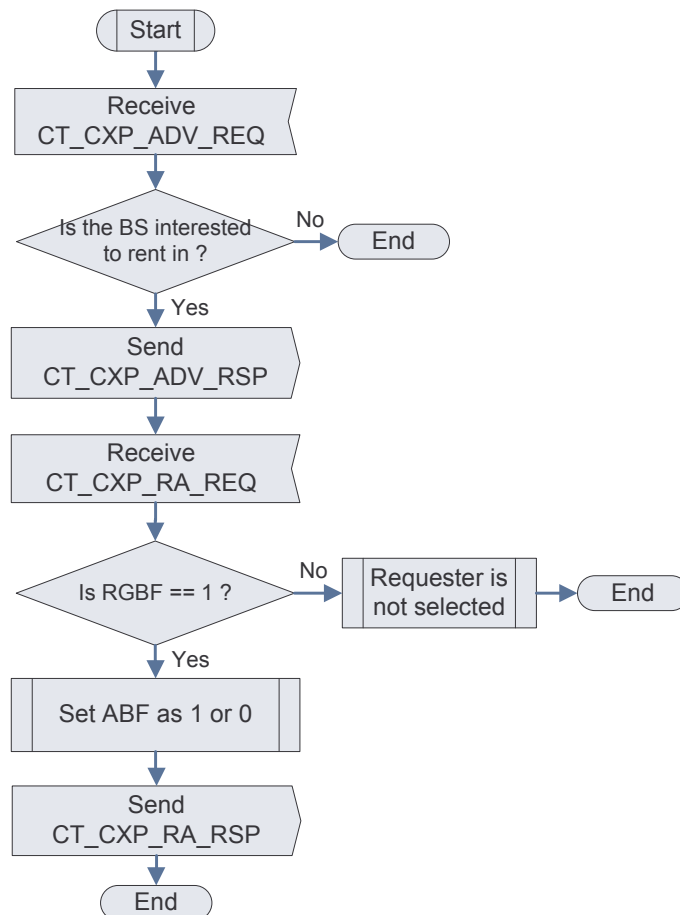


Figure h60: Over the air based CT-CXP requesting procedure

b) The procedure described in Figure h61 is as follows:

- If a BS is in need of additional resource, meets MNCT requirements, and agrees with the proposed negotiation mode (NMBF) and pricing method (PBF) specified within the “CT-CXP Advertisement Request” message, he can submit a bid (within “CT-CXP Advertisement Reply” message) upon the reception of the “CT-CXP Advertisement Request” message.
- Within the “CT-CXP Advertisement Reply” message, the requester informs about the amount of required resource (Rented_resource_amount), the rented in start and end time (Renting_in_start_time, Renting_in_end_time) and ~~the requester's~~ its bid (Requester_bid) in term of number of credit tokens bidded per renting resource unit (RRU).
 - If the non negotiation mode is active (NMBF == 0), same procedure as a) is executed. If the offeror BS can supply to the requester BS, the offeror BS grants the renting resource by setting the Resource Granting Bit Flag (RGBF) to 1 in the “CT-CXP Resource Allocation Request” message.
 - If the negotiation mode is active (NMBF == 1), iterative negotiation occurs between the offeror BS and each requester BS. At each iteration, based on the information Minimum_payoff and Maximal_payoff received from the “CT-CXP Negotiation Request” message, the requester decides to submit a new bid (Requester_bid_update) or not. Requester_bid_update is sent within the “CT-CXP Negotiation Reply” message. The iterative negotiation occurs until the negotiation period (bounded by End_negotiation_time) is elapsed.
- Upon reception of the “CT-CXP Resource Allocation Request” message, the requester BS knows whether it has been selected or not. If RGBF is set to 1, the requester BS is selected, otherwise (RGBF set to 0) the requester is rejected.
- The requester decides to accept (Acceptation Bit Flag ABF set to 1) or to reject (ABF set to 0) the resource granting based on the Clearing_price information. This information is sent within the “CT-CXP Resource Allocation Reply” message. The method to derive the clearing price is open for the implementation.
- If ABF is set to 1:
 - If PBF == 0, a number of CTs equal to ~~the~~ $\text{Clearing_price} \times \text{Rented_resource_amount} \times \text{T_renting_subframe} \times [(\text{Renting_in_end_time} - \text{Renting_in_start_time}) / \text{CX_Frame_duration}] / \text{RRU_duration}$ is transferred from the requester's ownership to the offeror's one. This calculation is an example and it is open for implementation.
 - If PBF == 1, the CT are not transferred but remains to the requester ownership. However, a number of credit tokens equal to the ~~clearing price previous number~~ (as calculated in the previous bullet point) will not be usable (for some ~~other further~~ renting requests by this same requester) for a time duration equal to [Requester's Renting_in_start_time; Requester's Renting_in_end_time + δ] where δ is a frozen period margin. This ensures fairness over time between competing requester BSs to access to some other renting offers.

[Replace Figure h61 with the following updated one as indicate:]

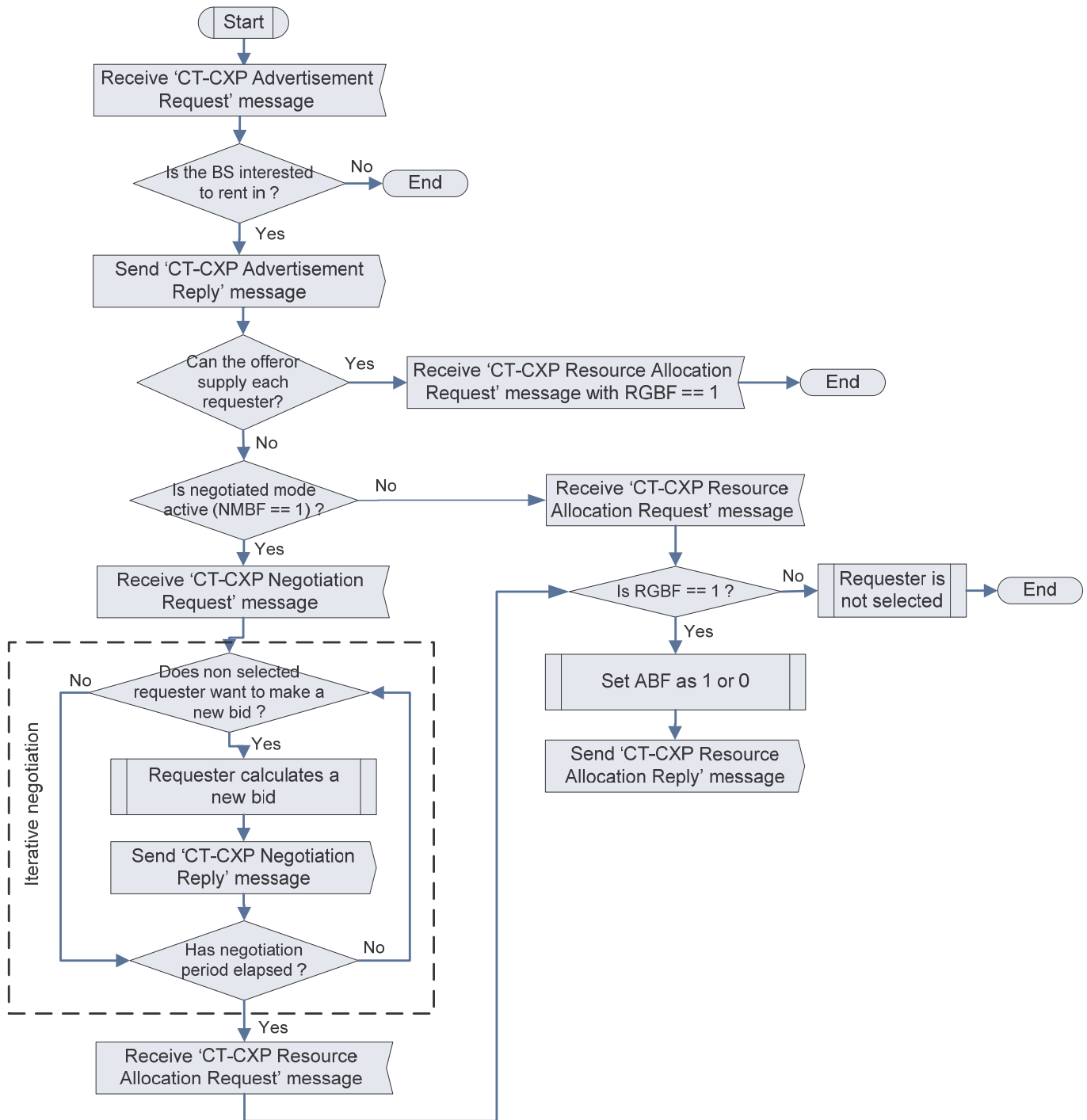


Figure h61: IP network based CT-CXP requesting procedure

15.4.2.4.2 Payoff calculation

This section provides an example on how the payoff ~~and clearing price mentioned~~ in section 15.4.2.4.1.2 can be calculated. This method is an example and the implementation is vendor specific.

At each iteration:

- i) The offeror BS calculates the payoff (Payoff_requester) corresponding to each remaining requester as follows:
- ii) $\text{Payoff_requester} = \text{Requester_bid_update} * \text{Rented_resource_amount} * [\text{T_renting_subframe} * (\text{Renting_in_end_time} - \text{Renting_in_start_time}) / \text{CX_Frame_duration}] / \text{RRU_duration}$.
- iii) The offeror selects the requesters that maximise jointly sum(Rented_resource_amount) and sum(Payoff_requester) over all the remaining requesters.
- iv) The offeror BS derives the Minimal_payoff and Maximal_payoff from the selected requesters and sends this information to all initial remaining requesters.
- v) Based on this information, each requester knows whether it has been selected or not by comparing its own Payoff_requester with Minimal_payoff.
- vi) Based on this comparison, the non selected requester decides to make a new bid (Requester_bid_update) or not for the next iteration of the negotiation.

15.4.2.4.3 Inter BSs communications for CT-CXP

CT-CXP requires inter BSs communication between different systems. These inter BS communications are necessary to exchange the parameters (Table h8) related to the CT-CXP procedures described in section 15.4.2.4.1.

The parameters related to CT-CXP (Table h8) are stored into the BSIS and into the database of each WirelessMAN-CX BS of the shared distributed system architecture (section 15.1.6).

The exchange of these parameters between BSs is supported through IP network inter-BS communications for the negotiated and non-negotiated modes. The related CXP messages are defined in section 15.5.1.

The exchange of these parameters between BSs is also supported with over the air MAC messages (defined in section 6.3.2.3) for the non-negotiated mode. Inter system over the air communications ~~mechnanisms~~mechanisms are detailed within clause 15.6.

[Add following acronym to the list in section 4 as indicate:]

4. Abbreviations and acronmys

RRU Renting Resource Unit

[Update text of section 6.3.2.3 as indicate:]

6.3.2.3 MAC management messages

[Update Table page 9 as indicate:]

| Type | Message Name | Message Description | Connection |
|--------|--|--|------------|
| 67 | BSD | Base Station Descriptor | Broadcast |
| 68 | SSURF | SS Uplink RF Descriptor | Basic |
| 69 | <u>CT_CXP</u> _ADPD | Advertisement Discovery Policy Descriptor <u>for CT-CXP operations</u> | Multicast |
| 70 | <u>CT_CXP</u> _ADV_-REQ | Advertisement Request <u>for CT-CXP operations</u> | Broadcast |
| 71 | <u>CT_CXP</u> _Notification | Notify whether the forwarding relaying SS completes the CT-CXP operations | Basic |
| 72 | <u>CT_CXP</u> _ADV_-RSP | Advertisement Response <u>for CT-CXP operations</u> | Basic |
| 73 | <u>CT_CXP</u> _RA_-REQ | Resource Allocation Request <u>for CT-CXP operations</u> | Basic |
| 74 | <u>CT_CXP</u> _RA_-RSP | Resource Allocation Response <u>for CT-CXP operations</u> | Basic |
| 75 | <u>CT_CXP</u> _ACK [*Editor's notes: the name of the CT message should be specific] | The offeror BS acknowledges the correct reception of <u>CT_CXP_RA_RSP</u> message <u>for CT-CXP operations</u> | Basic |
| 76 | BS_CCID_RSP | Base Station Co-Channel Interference Detection Indication | Basic |
| 77 | BS_CCID_REQ | Base Station Co-Channel Interference Detection Response | Basic |
| 78 | CXP-REQ-MAC | Coexistence Protocol Request MAC message | Broadcast |
| 79 | CXP-RSP-MAC | Coexistence Protocol Response MAC message | Broadcast |
| 80 | OCSI_MNTR_CFG | CSI monitoring request message | Broadcast |
| 81 | OCSI_MNTR_REP | CSI monitoring response message | Basic |
| 82-255 | | reserved | |

[Update text of sub-clauses 6.3.2.3.64, 6.3.2.3.65, 6.3.2.3.66, 6.3.2.3.67, 6.3.2.3.68, 6.3.2.3.69, 6.3.2.3.70 as indicate:]

6.3.2.3.64 CT_CXP Advertisement Discovery Policy Descriptor (CT_CXP_ADPD) message

CT_CXP_ADPD message (CT_CXP Advertisement Discovery Policy Descriptor) is sent from the home requester BS to its associated ~~forwarding~~relaying SSs as a regular multicast data message for the CT-CXP operations. Purpose of CT_CXP_ADPD is to instruct the attitude of each ~~forwarding~~relaying SS when the ~~forwarding~~relaying SS receives CT_CXP_ADV_REQ message. CT_CXP_ADPD specifies whether the ~~forwarding~~relaying SS has to ~~forward~~relay CT_CXP_ADV_REQ message toward it serving BS (requester BS).

CT_CXP_ADPD message shall include the following parameters:

BSID of the source BS: BSID of the requester BS

ID of the forwardingrelaying SS: ID of the forwardingrelaying BS

Renting_in_start_time: Starting time of the period from which the requester BS is interested to rent in some resources. For values received below this specified time, the forwardingrelaying SS associated BS is not allowed to report CT_CXP_ADV_REQ content to its home BS (requester). This starting time is identified by a UTC time stamp following the format HH:MM:SS:ms (*Table h1*) after the transmission of the message.

Renting_in_end_time: Ending time of the period the requester BS is interested to rent in some resources. For values received below this specified time, the forwardingrelaying SS is not allowed to report CT_CXP_ADV_REQ content to its home BS (requester). This ending time is identified by a UTC time stamp following the format HH:MM:SS:ms (*Table h1*) after the transmission of the message.

RCTN_MAX: Maximum admissible number of credit tokens per radio resource unit the requester BS will provide to get the radio resources proposed by the offeror BS. Above this number of tokens, the forwardingrelaying SS is not allowed to report CT_CXP_ADV_REQ content to this home BS (requester).

Table 108ac—CT_CXP_ADPD message format

| Syntax | Size | Notes |
|--|---------|--|
| <u>CT_CXP</u> _ADPD_Message_Format() { | | |
| Management Message Type = 69 | 8 bits | |
| BSID of the source BS | 48 bits | BSID of the requester |
| ID of the <u>forwardingrelaying</u> SS | 48 bits | ID of the <u>forwardingrelaying</u> SS |
| Renting_in_start_time | 16 bits | Absolute time based on UTC time stamp following the format HH:MM:SS:ms |
| Renting_in_end_time | 16 bits | Absolute time based on UTC time stamp following the format HH:MM:SS:ms |
| Maximum required number of credit token (RCTN_MAX) | 48 bits | |
| } | | |

6.3.2.3.65 CT_CXP Advertisement Request (CT_CXP_ADV_REQ) message

In support of the CT-CXP operations, the CT_CXP Advertisement Request (CT_CXP_ADV_REQ) message specifies the advertisement discovery information sent out by the offeror BS towards the forwardingrelaying SSs (associated to requester BSs and located in the overlapping area of this offeror system and the surrounding requester systems). The CT_CXP_ADV_REQ message is sent by the offeror BS within the time interval specified in subclause 15.1.5.3. If the CT_CXP_ADV_REQ content meets the CT_CXP_ADPD requirements, the forwardingrelaying SS forwardsrelays the CT_CXP_ADV_REQ message towards its serving BS followed up the mechanisms specified in subclause 15.1.5.3.

CT_CXP_ADV_REQ message provides the necessary information to these forwardingrelaying Ss to enable them then to inform their home BS (requester) about radio resources sharing opportunities proposed by the offeror BS.

CT_CXP_ADV_REQ message shall include the following parameters:

BSID of the source BS: BSID of the offeror

T_renting_subframe: Total amount of time per master subframe rented out by the offeror BS.

Renting_out_start_time: The starting time of the renting out period proposed by the offeror on that channel. Absolute time based on UTC time stamp following the format HH:MM:SS:ms (*Table h1*).

Renting_out_end_time: The ending time of the renting out period proposed by the offeror on that channel Absolute time based on UTC time stamp following the format HH:MM:SS:ms (*Table h1*).

MNCT: Minimum number of credit tokens per resource unit required per requester's bid.

LC: List of other channels (frequency domain) proposed by the offeror BS for renting.

Table 108ad—CT_CXP_ADV_REQ message format

| Syntax | Size | Notes |
|--|---------|---|
| <u>CT_CXP_ADV_REQ</u> _Message_Format () { | | |
| Management Message Type = 70 | 8 bits | |
| BSID of the source BS | 48 bits | BSID of the offeror |
| T_renting_subframe | 16 bits | Total amount of time per master subframe rented out by the offer or |
| Renting_out_start_time | 16 bits | The starting time of the renting out period proposed by the offeror on that channel Absolute time based on UTC time stamp following the format HH:MM:SS:ms |
| Renting_out_end_time | 16 bits | The ending time of the renting out period proposed by the offeror on that channel Absolute time based on UTC time stamp following the format HH:MM:SS:ms |
| Minimum number of Credit Token (MNCT) | 48 bits | Minimum number of credit tokens per <u>renting</u> resource unit (<u>RRU</u>) required per requester's bid |
| List of Channels (LC) | 16 bits | List of other channels (frequency domain) proposed by the offeror BS for renting |
| } | | |

6.3.2.3.66 CT_CXP Notification message

In order to ensure the CT_CXP_ADV_REQ message is appropriately received by the requester BS, CT_CXP_ADV_REQ message can be sent out by several forwardingrelaying SSs for the CT-CXP operations. If multiple CT_CXP_ADV_REQ messages are received from different forwardingrelaying SSs, the offeror BS selects only one forwardingrelaying SS to complete the remaining CT-CXP operations (CT_CXP_ADV_RSP, CT_CXP_RA_REQ, CT_CXP_RA_RSP). For that, the offeror BS notifies (through the notification message) each of the forwardingrelaying SS whether or not it should complete the remaining CT-CXP operations. CT_CXP_Notification message is a regular data message.

CT_CXP_Notification message shall include the following parameters:

BSID of the source BS: BSID of the offeror BS

ID of the forwardingrelaying SS: ID of the forwardingrelaying_SS

Notification Bit Flag (NBF): This flag indicates whether the forwardingrelaying SS is selected to complete the CT-CXP operations or not.

Table 108ae—CT_CXP Notification message format

| Syntax | Size | Notes |
|---|---------|---|
| <u>CT_CXP</u> _Notification_Message_Format () { | | |
| Management Message Type = 71 | 8 bits | |
| BSID of the source BS | 48 bits | BSID of the offeror |
| ID of the <u>forwardingrelaying</u> SS | 48 bits | ID of the <u>forwardingrelaying</u> SS |
| Notification Bit Flag (NBF) | 1 bit | This flag indicates whether the <u>forwardingrelaying</u> SS is selected to complete the <u>CT-CXP</u> operations or not: 1: <u>forwardingrelaying</u> SS is selected 0: <u>forwardingrelaying</u> SS is not selected |
| } | | |

6.3.2.3.67 CT_CXP Advertisement Response (CT_CXP_ADV_RSP) message

In response to the CT_CXP Advertisement Request message (CT_CXP_ADV_REQ), and if the forwardingrelaying SS has been selected to complete the CT-CXP operations (specified in notification message), the forwardingrelaying SS responds to the offeror with an CT_CXP Advertisement Reply message (CT_CXP_ADV_RSP) mentioning its interest to rent totally or a fraction of the resource offered by the offeror for the total or a portion of the proposed renting period [Renting_out_start_time, Renting_out_send_time]. CT_CXP_ADV_RSP content is aligned with renting requirements specified within CT_CXP_ADPD message.

The CT_CXP_ADV_RSP message is sent by the forwardingrelaying SS within the time interval and with mechanisms specified in subclause 15.1.5.3.

CT_CXP_ADV_RSP message shall include the following parameters:

ID of the source forwardingrelaying SS: ID of the forwardingrelaying SS

BSID of the source BS: BSID of the requester BS associated to the relaying-forwarding SS

BSID of the destination BS: BSID of the offeror BS

Requester_bid: Number of credit tokens per resource unit bid by the requester in response to the offeror advertisement.

Rented_resource_amount: Fraction (scalar) of T_renting_subframe the requester is interested in and bidding for.

Renting_in_start_time: Starting time of the period from which the requester is interested to rent in within [Renting_out_start_time, Renting_out_end_time], and for which the requester's bid applies for.

Renting_in_end_time: Ending time of the period the requester is interested to rent in within [Renting_out_start_time, Renting_out_end_time], and for which the requester's bid applies for.

Table 108af—CT_CXP_ADV_RSP message format

| Syntax | Size | Notes |
|--|---------|---|
| <u>CT_CXP_ADV_RSP</u> Message Format () { | | |
| Management Message Type = 72 | 8 bits | |
| ID of the source <u>forwarding</u> relaying SS | 48 bits | ID of the <u>forwarding</u> relaying SS |
| BSID of the source BS | 48 bits | BSID of the requester |
| BSID of the destination BS | 48 bits | BSID of the offeror |
| Requester_bid | 48 bits | Number of credit tokens per <u>renting</u> resource unit (<u>RRU</u>) bid by the requester in response to the offeror advertisement |
| Rented_resource_amount | 8 bits | Fraction (scalar) of T_renting_subframe the requester is interested in and bidding for |
| Renting_in_start_time | 16 bits | Absolute time based on UTC time stamp following the format HH:MM:SS:ms |
| Renting_in_end_time | 16 bits | Absolute time based on UTC time stamp following the format HH:MM:SS:ms |
| } | | |

6.3.2.3.68 CT_CXP Resource Allocation Request (CT_CXP_RA_REQ) message

For the CT-CXP operations, the CT_CXP Allocation Request (CT_CXP_RA_REQ) message informs each requester whether he is granted with the resource he bid for. Each granted requester is informed about the credit token price. Detailed process is described within clause 15.4.2.4. The CT_CXP_RA_REQ message is sent by the offeror BS within the time interval and with mechanisms specified in subclauses 15.1.5.3 and 15.6.

CT_CXP_RA_REQ message shall include the following parameters:

BSID of the source BS: BSID of the offeror BS

ID of the destination forwardingrelaying SS: ID of the forwardingrelaying SS

BSID of the destination BS: BSID of the requester BS associated to the forwardingrelaying SS

Resource_Granting_Bit_Flag (RBF): This flag indicates whether the offeror supplies the resource requested by the requester or not.

Renting_subframe_start_time: This field is useful only when RBF = 1. This field specifies the starting time of transmission of the selected requester within T_renting_subframe.

Renting_subframe_end_time: This field is useful only when RBF = 1. This field specifies the ending time of transmission of the selected requester within T_renting_subframe.

Clearing_price: This field is useful only when RBF = 1. Derived from the selection process, clearing price is the number of credit tokens per renting resource unit (RRU) the requester has to freeze to acquire the granted resource.

Table 108ag—CT_CXP_RA_REQ message format

| Syntax | Size | Notes |
|--|---------|---|
| <u>CT_CXP_RA_REQ</u> Message_Format () { | | |
| Management Message Type = 73 | 8 bits | |
| BSID of the source BS | 48 bits | BSID of the offeror |
| ID of the destination <u>forwardingrelaying</u> SS | 48 bits | ID of the <u>forwardingrelaying</u> SS |
| BSID of the destination BS | 48 bits | BSID of the requester associated to the <u>forwardingrelaying</u> SS |
| Resource_Granting_Bit_Flag (RBF) | 1 bit | This flag indicates whether the offeror supplies the resource requested by the requester or not: 10 – resource allocation is granted 0+ – resource allocation is rejected |

| | | |
|-----------------------------|---------|---|
| Renting_subframe_start_time | 16 bits | This field is useful only when RGBF == 1. This field specifies the starting time of transmission of the selected requester within T_renting_subframe. |
| Renting_subframe_end_time | 16 bits | This field is useful only when RGBF == 1. This field specifies the ending time of transmission of the selected requester within T_renting_subframe. |
| Clearing_price | 48 bits | This field is useful only when RGBF == 1. Derived from the selection process, clearing price is the number of credit tokens <u>per renting resource unit (RRU)</u> the requester has to freeze to acquire the granted resource. |
| } | | |

6.3.2.3.69 CT_CXP Resource Allocation Response (CT_CXP_RA_RSP) message

In response to the CT_CXP Resource Allocation Request message (CT_CXP_RA_REQ), the CT_CXP Resource Allocation Response (CT_CXP_RA_RSP) message indicates whether the requester accepts the granting at the proposed clearing price.

The CT_CXP_RA_RSP message is sent by the forwarding~~relaying~~ SS within the time interval and with mechanisms specified in subclause 15.1.5.3.

CT_CXP_RA_RSP message shall include the following parameters:

ID of the source ~~relaying~~forwarding SS: ID of the forwarding~~relaying~~ SS.

BSID of the source BS: BSID of the requester BS associated to the forwarding~~relaying~~ SS.

BSID of the destination BS: BSID of the offeror BS.

Acceptation_Bit_Flag (ABF): In case RGBF =1, this flag indicates that the requester accepts the granting at the proposed clearing price.

Table 108ah—CT_CXP_RA_RSP message format

| Syntax | Size | Notes |
|---|---------|--|
| <u>CT_CXP_RA_RSP</u> Message_Format () { | | |
| Management Message Type = 74 | 8 bits | |
| ID of the source <u>forwarding</u> relaying SS | 48 bits | ID of the <u>forwarding</u> relaying SS |
| BSID of the source BS | 48 bits | BSID of the requester |
| BSID of the destination BS | 48 bits | BSID of the offeror |

| | | |
|----------------------------|-------|--|
| Acceptation_Bit_Flag (ABF) | 1 bit | In case RGBF =1, this flag indicates whether the requester accepts the granting at the proposed clearing price: <u>10</u> – acceptance <u>0+</u> – rejection |
| } | | |

6.3.2.3.70 CT_CXP Acknowledgment (CT_CXP_ACK) message

The offeror BS acknowledges the reception of the CT_RA_RSP message with the CT_CXP_ACK message. The CT_CXP_ACK message is sent by the offeror BS within the time interval and with mechanisms specified in subclause 15.1.5.3. The forwardingrelaying SS forwardsrelays this message to its serving BS (requester) with regular data message to confirm that the requester BS can actually use the rented resources for the agreed renting period with the offeror BS.

Table 108ai—CT_CXP_ACK message format

| Syntax | Size | Notes |
|--|---------|--|
| <u>CT_CXP_ACK_Message_Format</u> () { | | |
| Management Message Type = 75 | 8 bits | |
| BSID of the source BS | 48 bits | BSID of the offeror |
| ID of the destination <u>forwardingrelaying</u> SS | 48 bits | ID of the <u>forwardingrelaying</u> SS |
| BSID of the destination BS | 48 bits | BSID of the requester associated to the <u>forwardingrelaying</u> SS |
| } | | |

[Update text of section 15.5 as indicate:]

15.5 Messages for WirelessMAN-CX

[Update Table h7 as indicate:]

Table h7—CXP message codes

| Code | CXP Message Name | CXP Message Type | Protocol type | Direction |
|------|--|------------------|---------------|-----------|
| 0 | Reserved | — | — | — |
| 27 | ... | | | |
| 35 | <u>CT-CXP</u> Advertisement Request <i>[Editor's notes: the name shall be specified to <u>CT-CXP</u>.]</i> | CXP-REQ | TCP | BS->BS |
| 36 | <u>CT-CXP</u> Advertisement Reply <i>[Editor's notes: the name shall be specified to <u>CT-CXP</u>.]</i> | CXP-RSP | TCP | BS->BS |
| 37 | <u>CT-CXP</u> Negotiation R Request <i>[Editor's notes: the name shall be specified to <u>CT-CXP</u>.]</i> | CXP-REQ | TCP | BS->BS |

| | | | | |
|--------|---|---------|-----|--------|
| 38 | CT-CXP Negotiation R Reply <i>[Editor's notes: the name shall be specified to CT-CXP.]</i> | CXP-RSP | TCP | BS->BS |
| 39 | CT-CXP Resource Allocation Request <i>[Editor's notes: the name shall be specified to CT-CXP.]</i> | CXP-REQ | TCP | BS->BS |
| 40 | CT-CXP Resource Allocation Reply <i>[Editor's notes: the name shall be specified to CT-CXP.]</i> | CXP-RSP | TCP | BS->BS |
| ... | ... | | | |
| 61-255 | Reserved | | | |
| | | | | |

[Update Table h8 as indicate:]

Table h8—TLV types for CXP payload

| Type | Parameter Description | Length (bytes) | Comment |
|--------------------|-----------------------------|-------------------|------------------------|
| 01 | BSID | 6 | |
| ... | ... | | |
| 51 | Renting_subframe_start_time | 2 | in millisecond |
| 52 | Renting_subframe_end_time | 2 | in millisecond |
| 53 | Acceptation_Bit_Flag (ABF) | 1 | scalar |
| 55 | LC | 1 | scalar |
| 55 4 | Reserved | | |
| ... | ... | | |

[Update text of sub-clauses 15.5.1.25, 15.5.1.26, 15.5.1.27, 15.5.1.28, 15.5.1.29, 15.5.1.30 as indicate:]

15.5.1.25 Advertisement ~~R~~Request

In support of CT-CXP operations, ~~T~~he offerer sends this broadcast ~~this~~ message to advertise to the surrounding future potential requester candidates that it offers temporally resource for renting.

Code: 35

Attributes are shown in *Table h25*.

Table h25—[CT-CXP](#) Advertisement ~~R~~Request message attributes

| Attribute | Contents |
|-----------------------|---------------------|
| BSID of the source BS | BSID of the offeror |

| | |
|---------------------------------------|--|
| Renting_out_start_time | The starting time of the renting out period proposed by the offeror on that channel |
| Renting_out_end_time | The ending time of the renting out period proposed by the offeror on that channel |
| Negotiation_Mode_Bit_Flag (NMBF) | This flag indicates which of negotiation mode of CT-CXP is used: 0 - non-negotiation mode is active 1 - negotiation mode is active |
| T_renting_subframe | Total amount of time per master subframe rented out by the offeror |
| Start_negotiation_time | If NMBF == 1, this field specifies the starting time of the negotiation between the offeror and the competing requesters. |
| End_negotiation_time | If NMBF == 1, this field specifies the ending time of the negotiation between the offeror and the competing requesters. |
| Pricing_Bit_Flag (PBF) | If NMBF == 1, PBF specifies the CT-CXP pricing method applicable to the negotiation mode for the selected requesters: 0 – CTs are transferred from the requester’s ownership to the offeror’s one 1 – No CTs transfer ownership from the requester to offeror. However, selected requester’s CTs are not usable by this requester for a given time period (the freezing time period) before reuse (the freezing time period). |
| Minimum number of Credit Token (MNCT) | Minimum number of credit tokens per renting resource unit (RRU) required per requester’s bid. |
| List of channels (LC) | List of other channels (frequency domain) proposed by the offeror BS for renting |

15.5.1.26 [CT-CXP Advertisement #Reply](#)

In response to [CT-CXP Advertisement Request message](#), ~~E~~each requester [can](#) responds to the offeror with an [CT-CXP Advertisement #Reply](#) message mentioning its interest to rent totally or a fraction of the resource offered by the offeror for the total or a portion of the proposed renting out period [[Renting_out_start_time](#), [Renting_out_end_time](#)], and its [Requester bid](#).

Code: 36

Attributes are shown in [Table h26](#).

Table h26—[CT-CXP Advertisement #Reply](#) message attributes

| Attribute | Contents |
|----------------------------|-----------------------|
| BSID of the source BS | BSID of the requester |
| BSID of the destination BS | BSID of the offeror |

| | |
|------------------------|---|
| Requester_bid | Number of credit tokens per <u>renting</u> resource unit (<u>RRU</u>) bid by the requester in response to the offeror advertisement |
| Rented_resource_amount | Fraction (scalar) of T_renting_subframe the requester is interested in and bidding for |
| Renting_in_start_time | Starting time of the period from which the requester is interested to rent in within [Renting_out_start_time, Renting_out_end_time], and for which the requester's bid applies for. |
| Renting_in_end_time | Ending time of the period the requester is interested to rent in within [Renting_out_start_time, Renting_out_end_time], and for which the requester's bid applies for. |

15.5.1.27 CT-CXP Negotiation ~~Request~~

This message is used only if $NMBF == 1$.

The CT-CXP Negotiation ~~Request~~ message is sent out by the offeror only when the NMBF~~CT-CXP~~ mode flag is set to 1 in the CT-CXP Advertisement ~~Request~~ message, i.e. when the CT-CXP negotiation mode is active. At each iteration of the negotiation, the decision making algorithm applied by the offeror derives a minimum and maximal payoff based on the requesters' bids. At each of these iterations, updated values of these payoffs are provided by the offeror to the requesters still bidding for the renting.

Code: 37

Attributes are shown in *Table h27*.

Table h27—CT-CXP Negotiation Request message attributes

| Attribute | Contents |
|----------------------------|---|
| BSID of the source BS | BSID of the offeror offer or |
| BSID of the destination BS | BSID of the requester |
| Minimal_payoff | Minimal derived payoff corresponding to the lower selected bid at the n^{th} iteration of the negotiation |
| Maximal_payoff | Maximal derived payoff corresponding to the higher selected bid at the n^{th} iteration of the negotiation |

15.5.1.28 CT-CXP Negotiation Reply

Based on the minimal and maximal payoff information, the CT-CXP Negotiation Reply message is sent out by the requester in response to CT-CXP Negotiation Request message in case the requester is willing to make a new bid proposal to be part of the selected requesters.

Code: 38

Attributes are shown in *Table h28*.

Table h28—CT-CXP Negotiation Reply message attributes

| Attribute | Contents |
|----------------------------|--|
| BSID of the source BS | BSID of the requester |
| BSID of the destination BS | BSID of the offeror |
| Requester_bid_update | Updated number of credit tokens per renting resource unit (RRU) bid by the requester in response to CT-CXP Negotiation Request message |

15.5.1.29 [CT-CXP Resource Allocation Request](#)

After the negotiation is complete, the [CT-CXP Resource Allocation Request](#) message informs each requester whether he is granted with the resource he bid for. Each granted requester is informed about the credit token clearing price [necessary to complete the CT-CXP operations. Derived from the selection process, the clearing price corresponds to the number of credit tokens per RRU that has to be considered by the selected renter to derive the total number of credit tokens to be considered in the pricing method specified within PBF flag of CT-CXP Advertisement Request message.](#) ~~Clearing pricing is executed followed up the method specified in the Advertisement Request message.~~

Code: 39

Attributes are shown in *Table h29*.

Table h29—CT-CXP Resource Allocation Request message attributes

| Attribute | Contents |
|-------------------------------------|---|
| BSID of the source BS | BSID of the offeror |
| BSID of the destination BS | BSID of the requester |
| Resource_Granteeing_Bit_Flag (RGGF) | This flag indicates whether the offeror supplies the resource requested by the requester or not: 1 – resource allocation is granted 0 – resource allocation is rejected |
| Renting_subframe_start_time | This field is useful only when RGGF == 1. This field specifies the starting time of transmission of the selected requester within T_renting_subframe. |
| Renting_subframe_end_time | This field is useful only when RGGF == 1. This field specifies the ending time of transmission of the selected requester within T_renting_subframe. |
| Clearing_price | This field is useful only when RGGF == 1. Derived from the selection process, clearing price is the number of credit tokens the renter has to freeze to acquire the granted resource. Derived from the selection process, the clearing price corresponds to the number of credit tokens per RRU that has to be considered by the selected renter to derive the total number of credit tokens to be considered in the pricing method specified within PBF flag of CT-CXP Advertisement Request message. |

15.5.1.30 CT-CXP Resource Allocation Reply

In response to the CT-CXP Resource Allocation Request message, the CT-CXP Resource Allocation Reply message indicates whether the requester accepts the granting at the proposed clearing price.

Code: 40

Attributes are shown in *Table h30*.

Table h30—CT-CXP Resource Allocation Reply message attributes

| Attribute | Contents |
|----------------------------|--|
| BSID of the source BS | BSID of the requester |
| BSID of the destination BS | BSID of the offeror |
| Acceptation_Bit_Flag (ABF) | In case RGBF == 1, this flag indicates whether the requester accepts the granting at the proposed clearing price: 1 – acceptance 0 – rejection |

[Update text of section 15.6 as indicate:]

15.6 Inter-system over the air communications

15.6.1 CT-CXP

Figure h64 describes the over the air communications messages between the offeror and requester for CT-CXP operations. The messages between the offeror BS and requester BSs are conveyed through SS(s) acting as forwarder~~relay~~ between the offeror and requester BSs. Each forwarding~~relaying~~ SS is associated to the requester BS and is in the overlapping coverage of the offeror and requester BSs. The forwarding~~relaying~~ SS can receive and decode messages from both its serving BS (requester BS) and the foreign BS (offeror BS), and can send transmit message to both offer or and requester BS.

[Replace Figure h64 with the following updated one as indicate:]

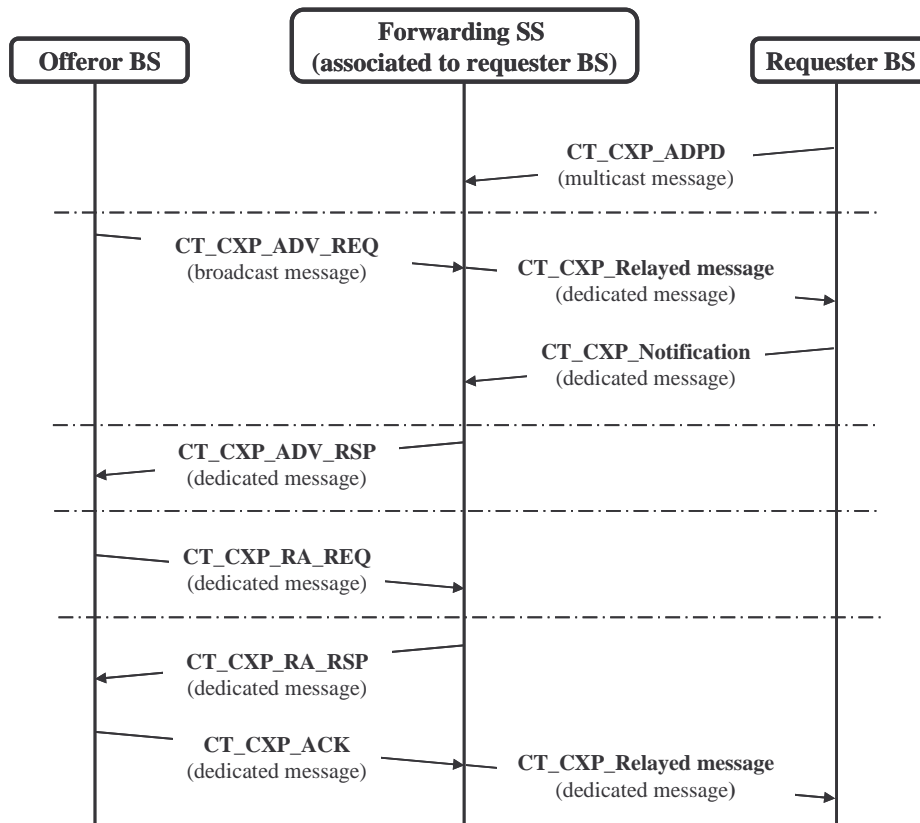


Figure h64—Inter system over the air communications messages for CT-CXP operations

CT_CXP_ADPD message (CT_CXP Advertisement Discovery Policy Descriptor) is sent from the home requester BS to its associated forwardingrelaying SSs as a regular multicast data message. Purpose of CT_CXP_ADPD is to instruct the attitude of each forwardingrelaying SS when it receives CT_CXP_ADV_REQ message. CT_CXP_ADPD specifies whether the forwardingrelaying SS has to forwardrelay CT_CXP_ADV_REQ message toward its serving BS (requester BS). If the content of CT_CXP_ADV_REQ message meets the requirements instructed in CT_CXP_ADPD, the forwardingrelaying SS actually forwardsrelays CT_CXP_ADV_REQ message content from the offeror BS to its serving BS (requester BS). Otherwise, it does not. That way, CT_CXP_ADPD rules the transmissions from any forwardingrelaying SS towards its serving BS. This mechanism avoids having incessant transmissions from the relayingforwarding SS towards its serving BS when renting conditions proposal specified in CT_CXP_ADV_REQ does not meet the requester BS's need. Any policy can be established and can be adapted dynamically in time by the requester.

The CT_CXP_ADV_REQ message is sent by the offeror BS within the time interval specified in subclause 15.1.5.3. If the CT_CXP_ADV_REQ content meets the CT_CXP_ADPD requirements, the forwardingrelaying SS forwardsrelays the CT_CXP_ADV_REQ message towards its serving BS followed up the mechanisms specified in subclause 15.1.5.3. In order to ensure the CT_CXP_ADV_REQ message is appropriately received by the requester BS, CT_CXP_ADV_REQ message can be sent out by several forwardingrelaying SSs. If multiple CT_CXP_ADV_REQ messages are received from different forwardingrelaying SSs, the offeror BS selects only one forwardingrelaying SS to complete the remaining CT-CXP operations (CT_CXP_ADV_RSP, CT_CXP_RA_REQ, CT_CXP_RA_RSP). For that, the offeror BS notifies (through the notification message) each of the forwardingrelaying SS whether or not it should complete the remaining CT-CXP operations. Once the selected forwardingrelaying SS has received the CT_CXP_ACK message from the offeror BS, it

forwards~~relays~~ this message to its serving BS (requester) to confirm that the requester BS can actually use the rented resources for the agreed renting period with the offeror BS.

During the initial phase, as previously mentioned, in case the renting conditions sent in CT_CXP_ADAP message are not met, the forwarding~~relaying~~ SS does not forward~~relay~~ the CT_CXP_ADV_REQ message to its serving BS (requester). However, upon requester BS recommendation (policy), even if the renting conditions are not met, the requester BS can allow the forwarding~~relaying~~ SS to convey the information about the list of channel LC (parameter included in CT_CXP_ADV-REQ). This information will provide the serving BS some further information about other radio resources renting opportunities on other channel (frequency domain).

Whole CT-CXP procedures are detailed in clause *15.4.2.4*.

References

[1] IEEE 802.16h/D2b: Part 16: Air Interface for Fixed Broadband Wireless Access Systems Amendment for Improved Coexistence Mechanisms for License-Exempt Operation; 2007-05-18.